Beam-Deflection Tube

9-PIN MINIATURE TYPE

For Use in Balanced-Modulator, Balanced Mixer, and Frequency-Converter Applications in Single- and Double-Sideband, Suppressed-Carrier Communication Equipment Operating at Frequencies up to 100 Mc

GENERAL DATA

Electrical:

Heater, for Unipotential Cathode:		
Voltage (AC or DC)	6.3 ± 10%	volts
Current	0.35	amp
Direct Interelectrode Capacitances (Approx.):[a]		
Grid No.1 to all other electrodes except plate	7.5	μμf
Grid No.1 to deflecting electrode No.1	0.015	μμf
Grid No.1 to deflecting electrode No.2	0.015	μμf
Grid-No.1 to plate No.1	0.003	μμf
Grid No.1 to plate No.2	0.003	μμf
Plate No.1 to all other electrodes except deflecting electrode No.1	0.8	μμf
Plate No.2 to all other electrodes except deflecting electrode No.2	0.8	μμf
Plate No.1 to plate No.2	0.3	μμf
Deflecting electrode No.1 to all other electrodes except plate No.1	4.6	μμf
Deflecting electrode No.2 to all other electrodes except plate No.2	4.6	μμf
Deflecting electrode No.1 to plate No.1	4	μμf ←
Deflecting electrode No.2 to plate No.2	4	μμf ←
Deflecting electrode No.1 to deflecting electrode No.2	1.4	μμf

Characteristics, Class A_1 Amplifier:

Plate-No.1 Supply Voltage	150	volts
Plate-No.2 Supply Voltage	150	volts
Deflecting-Electrode-No.1 Supply Voltage	25	volts
Deflecting-Electrode-No.2 Supply Voltage	25	volts
Grid-No.2 Supply Voltage	175	volts
Cathode Resistor	150	ohms
Total Beam Current (Plate-No.1 current plus plate-No.2 current)	8.5	ma ←
Grid-No.2 Current	2.1	ma ←

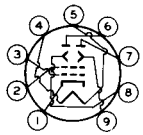
← Indicates a change.

Transconductance:		
Grid No.1 to both plates connected together	5400	μmhos
→ Deflecting electrode No.1 to plate No.1[b]	800	μmhos
Deflecting electrode No.2 → to plate No.2[b]	800	μmhos
Switching Voltage[c]	11	volts

Mechanical:

Operating Position	Any
Maximum Overall Length	2-5/8"
Maximum Seated Length	2-3/8"
Length, Base Seat to Bulb Top (Excluding tip)	2" ± 3/32"
Diameter	0.750" to 0.875"
Dimensional Outline	See *General Section*
Bulb	T6-1/2
Base	Small-Button Noval 9-Pin (JEDEC No.E9-1)
Basing Designation for BOTTOM VIEW	9KS

Pin 1 – Cathode, Internal Shield
Pin 2 – Grid No.2
Pin 3 – Grid No.1
Pin 4 – Heater
Pin 5 – Heater



Pin 6 – Plate No.2
Pin 7 – Plate No.1
Pin 8 – Deflecting Electrode No.2
Pin 9 – Deflecting Electrode No.1

BALANCED MODULATOR

Maximum Ratings, *Absolute-Maximum Values:*

PLATE-No.1 VOLTAGE	300	max.	volts
PLATE-No.2 VOLTAGE	300	max.	volts
DEFLECTING-ELECTRODE-No.1 VOLTAGE	±100	max.	volts
DEFLECTING-ELECTRODE-No.2 VOLTAGE	±100	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	250	max.	volts
GRID-No.2 INPUT	0.5	max.	watt
PLATE-No.1 DISSIPATION	1.5	max.	watts
PLATE-No.2 DISSIPATION	1.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	180	max.	volts
Heater positive with respect to cathode	180[d]	max.	volts

Typical Operation:

In accompanying balanced-modulator circuit utilizing separate excitation[e]

Plate Voltage (Each plate)	150	volts
Deflecting-Electrode Voltage (Approx., each electrode)	25	volts
Grid-No.2 Voltage	175	volts

→ Indicates a change.

Cathode Resistor	1200		ohms
Peak-to-Peak AF Deflecting-Electrode Voltage[f]	2.8		volts
Peak-to-Peak RF Grid-No.1 Voltage	10		volts
Plate Current (Each plate)	1.5		ma
Grid-No.2 Current	0.75		ma
Plate-to-Plate Load Impedance (Approx.)	5000		ohms
Push-Pull, Peak-to-Peak Double-Sideband Output Voltage	4		volts
Carrier Suppression[g]	60		db ←
Third-Order Distortion[g]	-47		db
Fourth-Order Distortion[g]	-45		db

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5	max.	megohm
For cathode-bias operation	2.2	max.	megohms
Deflecting-Electrode-Circuit Resistance (Per deflecting electrode)	0.05	max.	megohm

BALANCED MIXER

Maximum Ratings, *Absolute-Maximum Values:*

PLATE-No.1 VOLTAGE	300	max.	volts
PLATE-No.2 VOLTAGE	300	max.	volts
DEFLECTING-ELECTRODE-No.1 VOLTAGE	±100	max.	volts
DEFLECTING-ELECTRODE-No.2 VOLTAGE	±100	max.	volts
GRID-No.2 (SCREEN-GRID) VOLTAGE	250	max.	volts
GRID-No.2 INPUT	0.5	max.	watt
PLATE-No.1 DISSIPATION	1.5	max.	watts
PLATE-No.2 DISSIPATION	1.5	max.	watts
PEAK HEATER-CATHODE VOLTAGE:			
Heater negative with respect to cathode	180	max.	volts
Heater positive with respect to cathode	180[d]	max.	volts

Typical Operation:

In accompanying balanced-mixer circuit utilizing separate excitation[e]

Plate Voltage (Each plate)	150	volts
Deflecting-Electrode Voltage (Approx., each electrode)	25	volts
Grid-No.2 Voltage	175	volts
Cathode Resistor	1200	ohms
Peak-to-Peak Single-Sideband Deflecting-Electrode Voltage[f]	8	volts
Peak-to-Peak RF Grid-No.1 Voltage	10	volts
Plate Current (Each plate)	1.5	ma
Grid-No.2 Current	0.75	ma

← Indicates a change.

Plate-to-Plate Load Impedance (Approx.)	10000		ohms
Push-Pull, Peak-to-Peak Single-Sideband Output Voltage	40		volts
Oscillator Rejection[g]	-40		db
Third-Order Distortion[g]	-40		db
Fourth-Order Distortion[g]	-39		db

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5	max.	megohm
For cathode-bias operation	2.2	max.	megohms
Deflecting-Electrode-Circuit Resistance (Per deflecting electrode)	0.05	max.	megohm

[a] Without external shield.

[b] Defined as the partial derivative of the plate current with respect to the difference between the deflecting-electrode voltages, evaluated about the point of equal plate currents.

[c] Defined as the sum of (a) the absolute value of the difference between the deflecting-electrode voltages when the current to one plate is equal to 90% of the total beam current and (b) the absolute value of the difference between the deflecting-electrode voltages when the current to the same plate is equal to 10% of the total beam current. This sum, expressed in terms of signal voltage, corresponds to the peak-to-peak value of signal voltage that is required between the deflecting electrodes to produce peak-to-peak signal current at either plate equal to 80% of the total beam current.

[d] The dc component must not exceed 100 volts.

[e] Operation with self-excitation and cathode resistor of 300 ohms is similar to operation with separate excitation.

[f] To either deflecting electrode. The other deflecting electrode is bypassed.

[g] Referred to single-sideband output voltage.

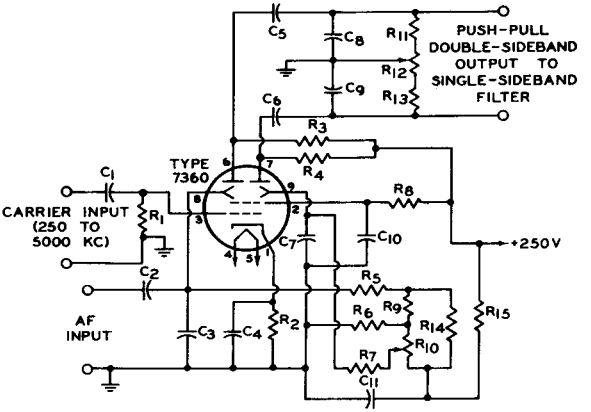
OPERATING CONSIDERATIONS

Deflecting-electrode-circuit resistance should be kept below 0.05 megohm to prevent nonlinear tube operation. The resistances of the two deflecting-electrode circuits should be approximately equal to minimize unbalance. The current drawn by each *deflecting-electrode* is in the order of 40 microamperes.

Magnetic fields adversely affect the intrinsic operating plate-current balance of the 7360. Although this tube is internally shielded to minimize this effect, the tube should be mounted as far as possible from all devices producing extraneous magnetic fields such as transformers, chokes, motors, or similar components. It is recommended that an external shield be used in those applications critical for balance.

Chassis layout should be such that all components and wiring associated with the plates and deflecting electrodes is symmetrical. This consideration is particularly important in rf applications where very small differences in stray capacitance can result in unbalance. Chassis layouts which permit heat or vibration to affect the components associated with one deflecting-electrode circuit or plate circuit more than the other, should be avoided. All components should be rigidly mounted.

BALANCED-MODULATOR CIRCUIT
With Separate Excitation



C_1: 0.001 μf
C_2: 0.22 μf
C_3: 0.001 μf
C_4: 0.01 μf
C_5 C_6: 0.0033 μf
C_7: 0.1 μf
C_8 C_9: Sufficient to resonate input of SSB filter
C_{10}: 0.22 μf
C_{11}: 0.47 μf
R_1: 0.47 megohm
R_2: 1200 ohms
R_3 R_4: 68000 ohms
R_5: 47000 ohms
R_6: 12000 ohms
R_7: 47000 ohms
R_8: 0.1 megohm
R_9: 2700 ohms
R_{10}: Carrier-Balance Potentiometer, 5000 ohms
R_{11}: 2700 ohms
R_{12}: Quadrature-Balance Potentiometer, 2500 ohms
R_{13} R_{14}: 2700 ohms
R_{15}: 0.1 megohm
NOTE: All resistors 1/2 watt, ± 10% unless specified. All capacitors 400 volts.

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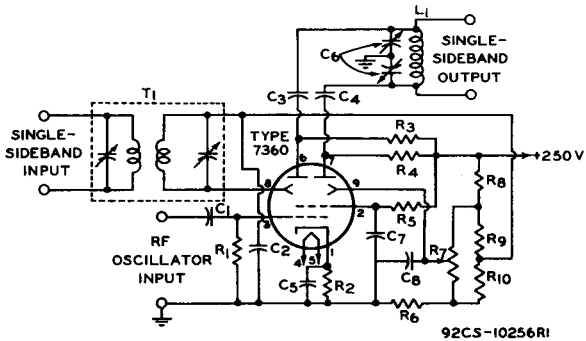
BALANCED-MIXER CIRCUIT
With Separate Excitation



C_1: 0.001 μf
C_2: 0.04 μf
C_3 C_4: 0.001 μf
C_5: 0.04 μf
C_6: Split-Stator Tuning Capacitor to Resonate with L_1
C_7 C_8: 0.04 μf
L_1: Inductor
R_1: 0.47 megohm
R_2: 1200 ohms
R_3 R_4: 68000 ohms
R_5: 0.1 megohm
R_6: 12000 ohms
R_7: Oscillator-Rejection Potentiometer, 5000 ohms
R_8: 0.1 megohm
R_9 R_{10}: 2700 ohms
T_1: Tuned Input Transformer
NOTE: All resistors 1/2 watt, ± 10%, unless specified. All capacitors 400 volts.

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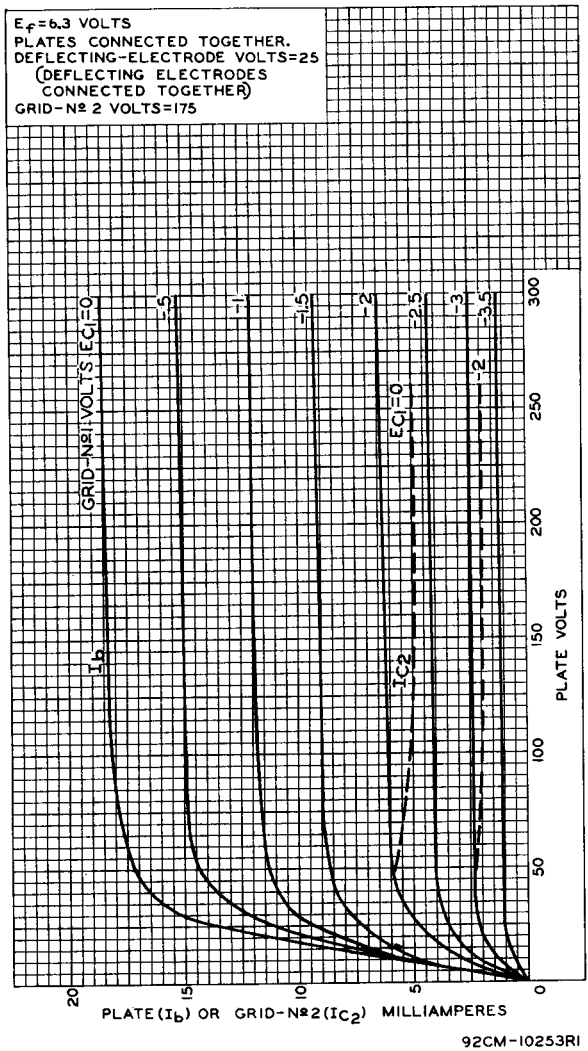
RADIO CORPORATION OF AMERICA
Electron Tube Division Harrison, N. J.

AVERAGE CHARACTERISTICS



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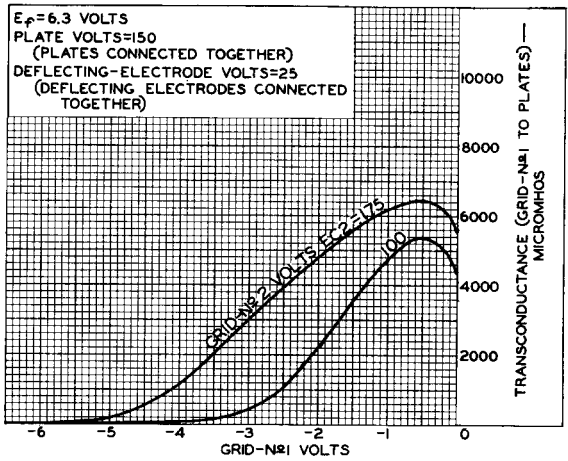

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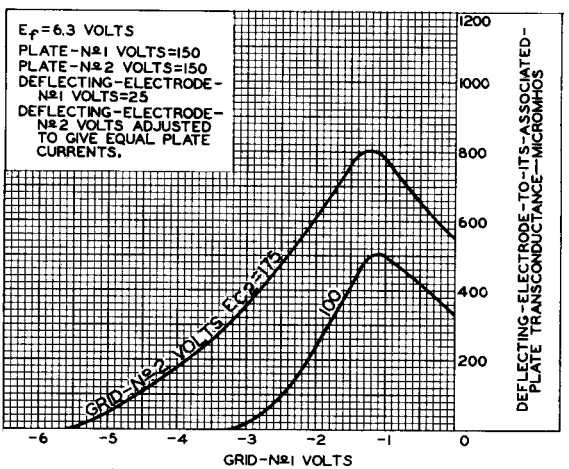

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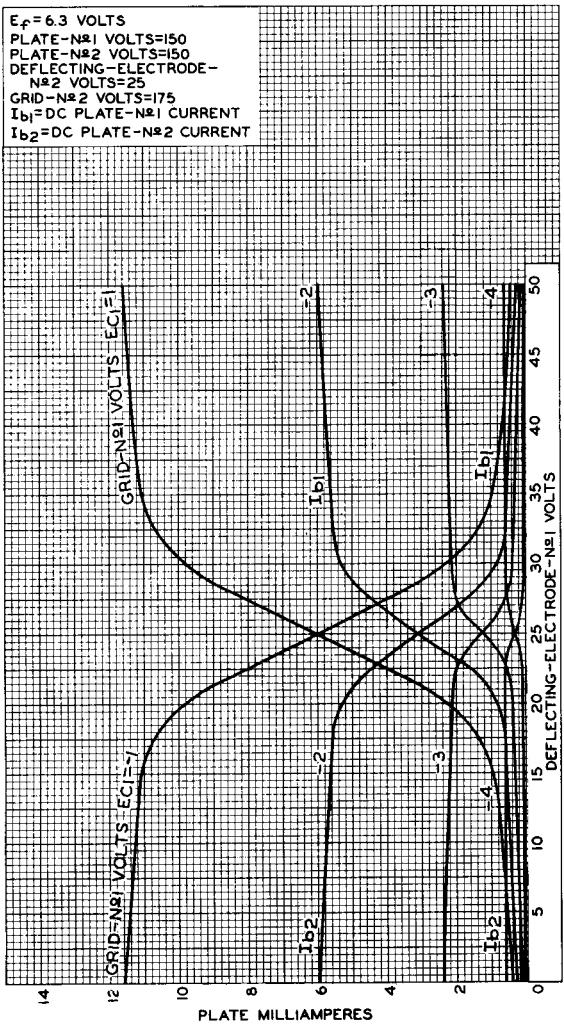

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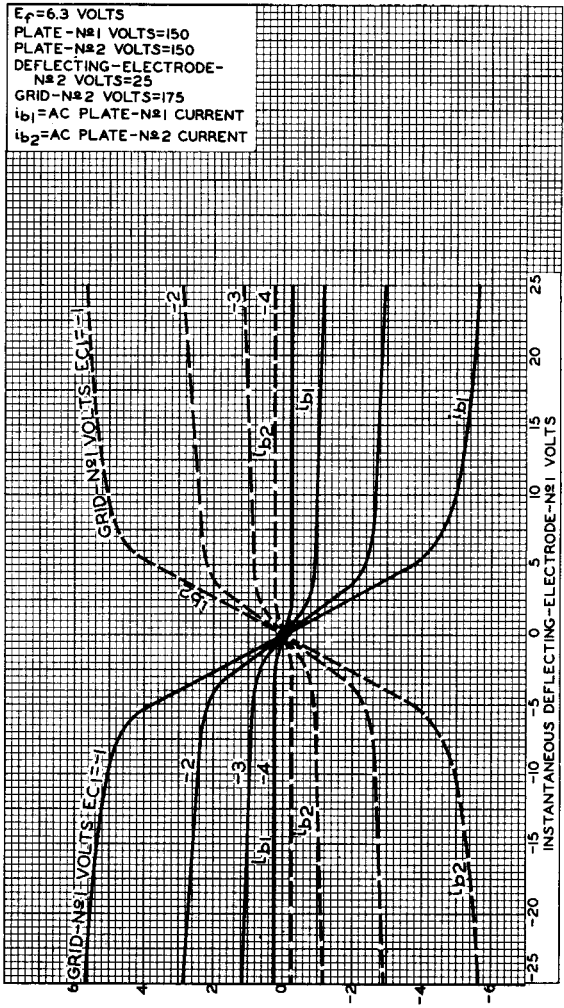
OPERATION CHARACTERISTICS



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